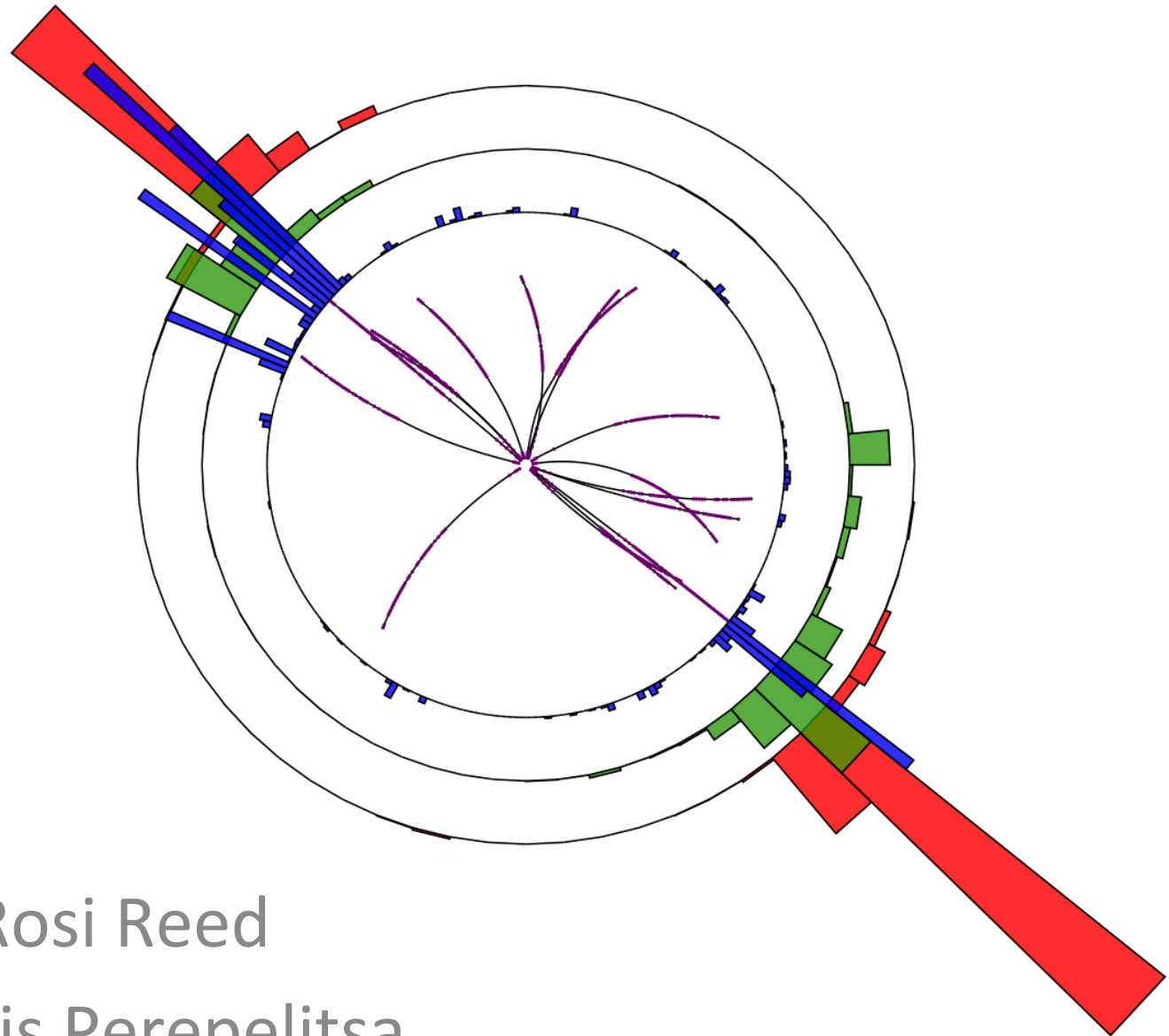


Jet Structure Topical Group Update



Rosi Reed

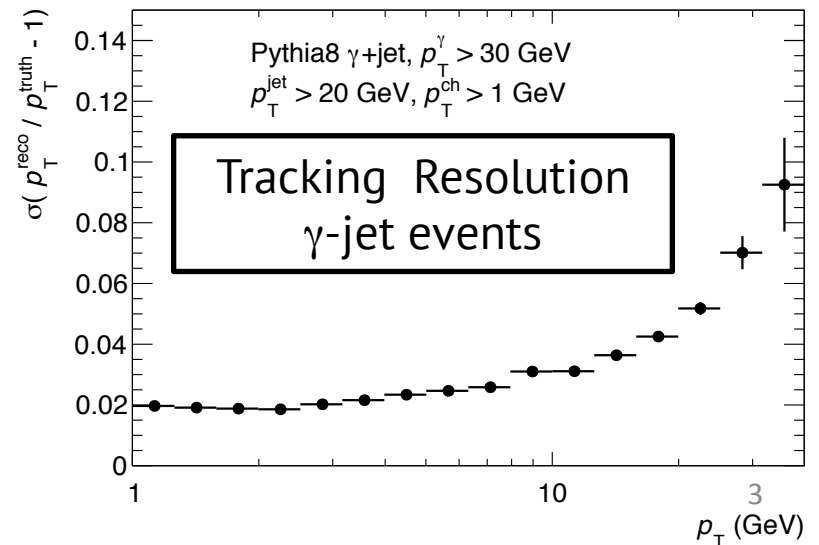
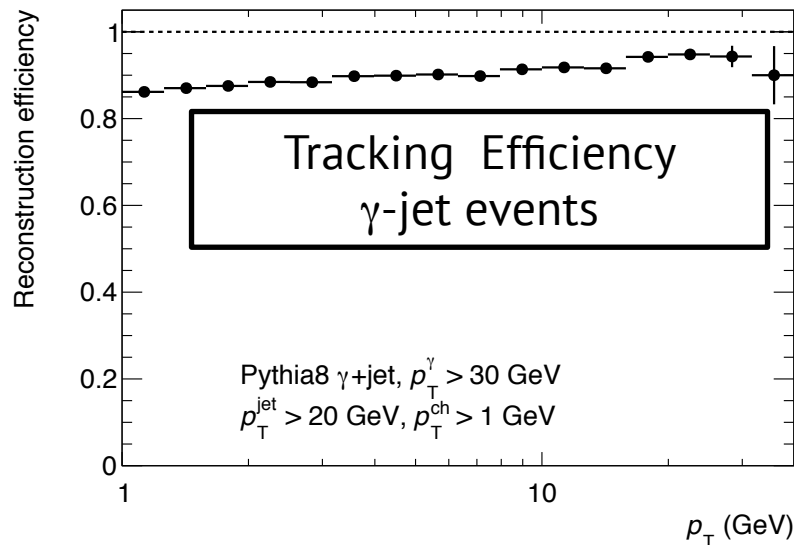
Dennis Perepelitsa

Structure in Jet structure

- Most of our effort has been on the jet ($+\gamma$) part of jet structure
- We would like to move to analyzing more structure based observables
 - Requires person power – looking for volunteers
 - We had fastjet-contrib added into the build
 - For AA the UE subtraction needs to be implemented first
 - Invited expert to speak to the group → keep current with changing heavy ion jet picture

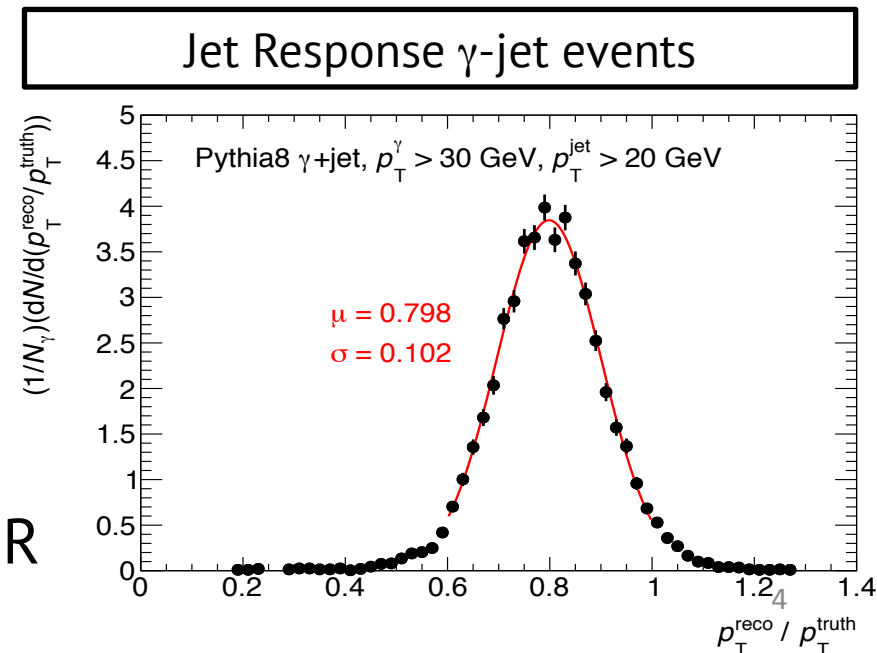
Jet structure current tasks

- Need to test the performance of jet, photon, and track reconstruction with the latest G4 simulations
 - pp and pp embedded into AA
 - Produce set of commonly used files
- EMCal + HCAL \rightarrow hermetic jet measurement
- High resolution tracker will allow jet structure measurements



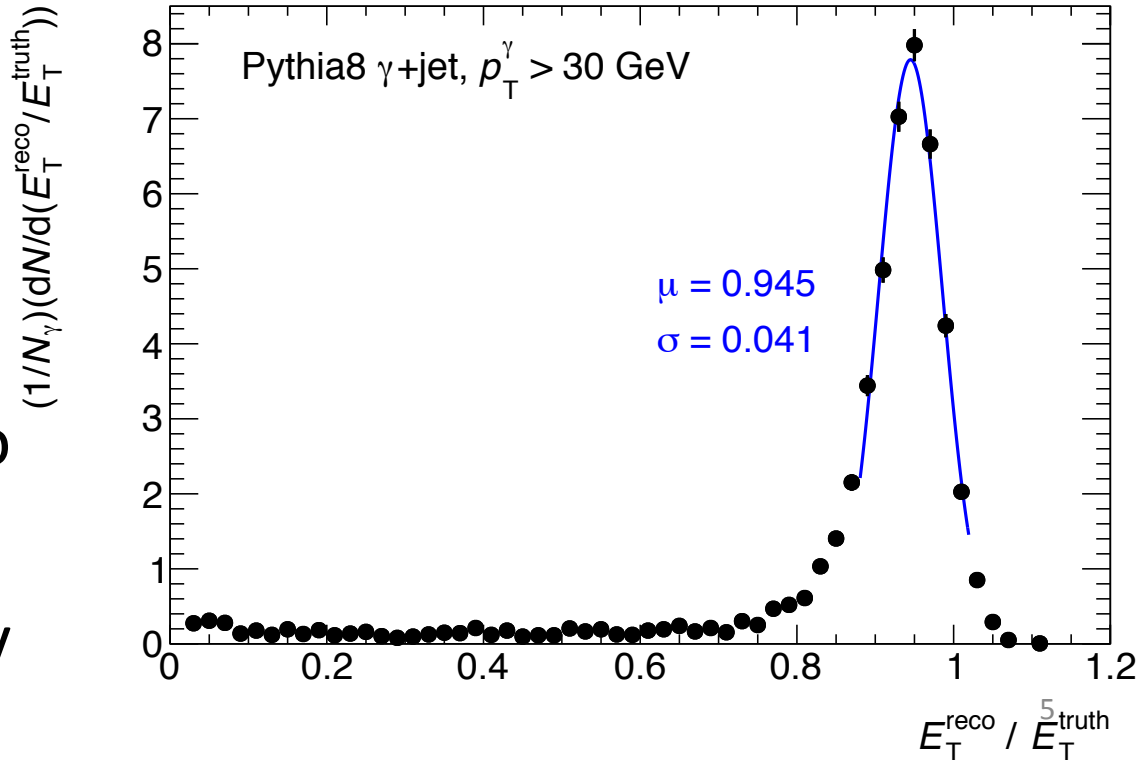
Jet structure current tasks - Background

- Jet algorithms for clustering and background removal are under investigation
 - A wealth of background removal techniques have been developed, which one works best for sPHENIX?
 - Sarah Campbell has volunteered to help with this effort
- Unfolding tests required to verify the validity of background removal techniques
- A lot of interest in full G4 results at QM
 - Questions of how these results will compare to pCDR

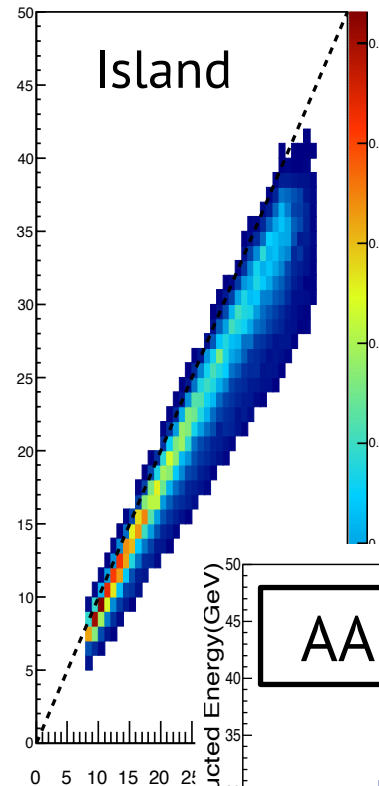
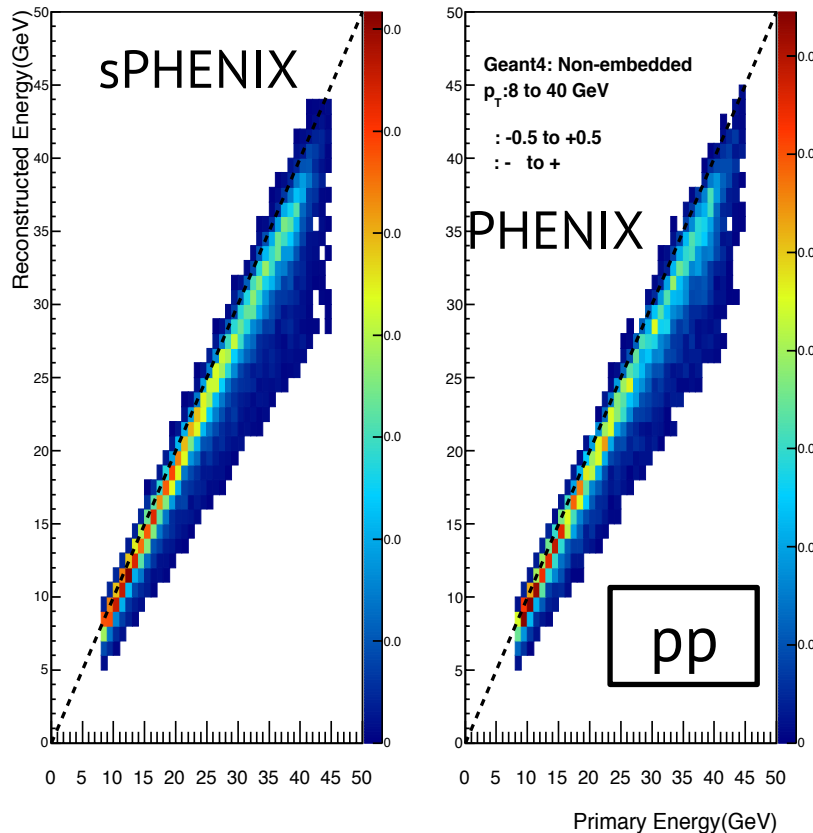


Jet structure current tasks – γ clustering

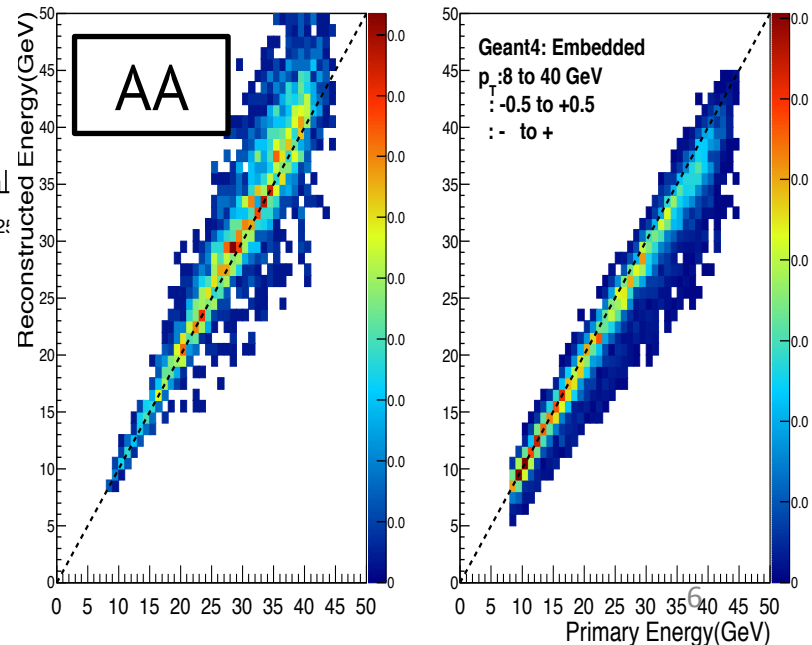
- Photon clustering algorithms are under way
 - Much work done by Justin Frantz and Joe Osborn
 - pp and AA \rightarrow Eventually pp embedding AA
 - Do existing algorithms perform well enough?
 - sPHENIX default
 - PHENIX
 - CMS Island
- Key to “golden” probe measures
 - Fortunately easy to simulate 1 year of expected luminosity



Jet structure current tasks – γ clustering



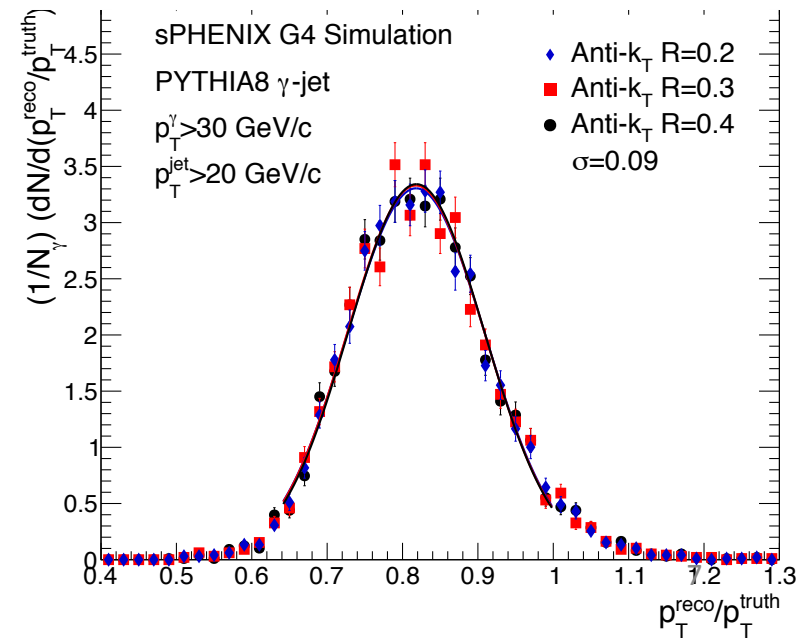
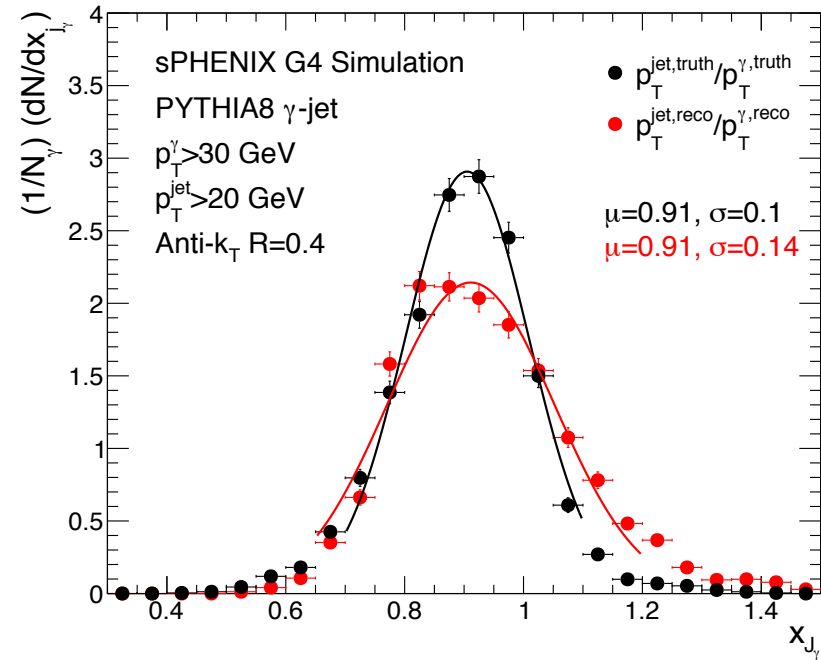
- Default algorithm doesn't perform well in AA



- Deliverable will be all algorithms available in sPHENIX framework

Jet-to-Photon p_T balance

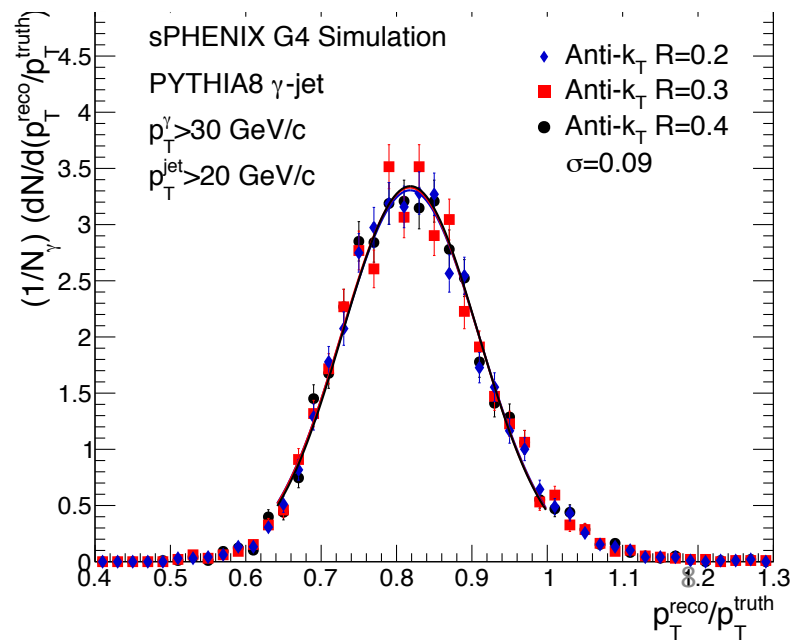
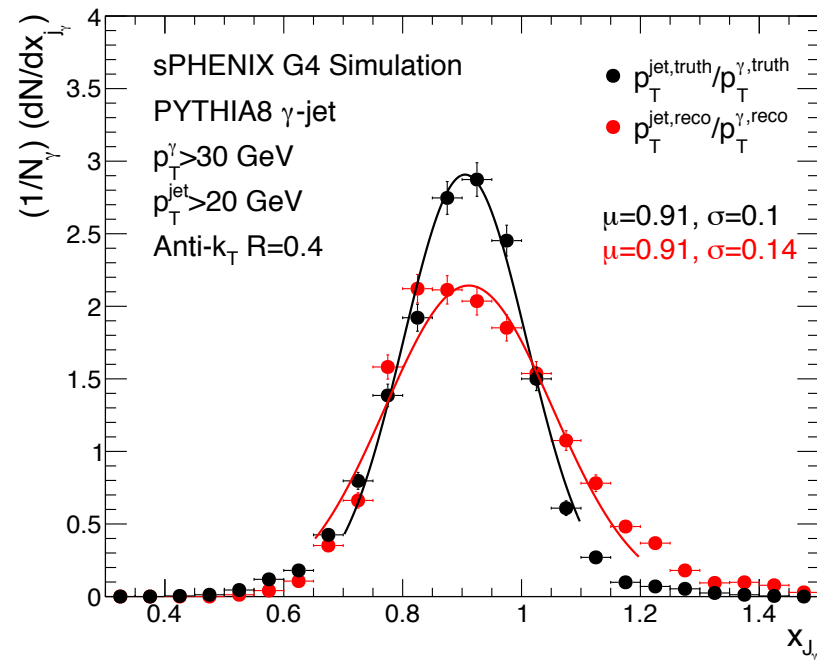
- Simulation of pp γ -jet events
- Compare energy clustered into jet versus photon
 - Effect of Calorimeter detector resolution
- Performance with heavy ion background needs to be quantified
 - What is the best R choice?
 - Requires a robust background subtraction method
- γ -jet \rightarrow dominated by quark jets
 - Allows a flavor comparison between quarks and gluons
 - Allows direct comparison with LHC results
- Other observables under consideration



Jet-to-Photon p_T balance

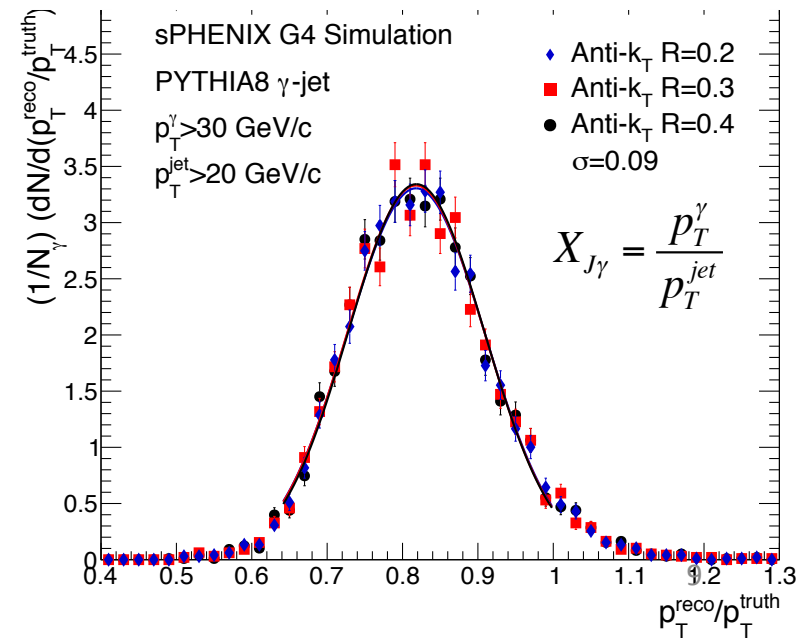
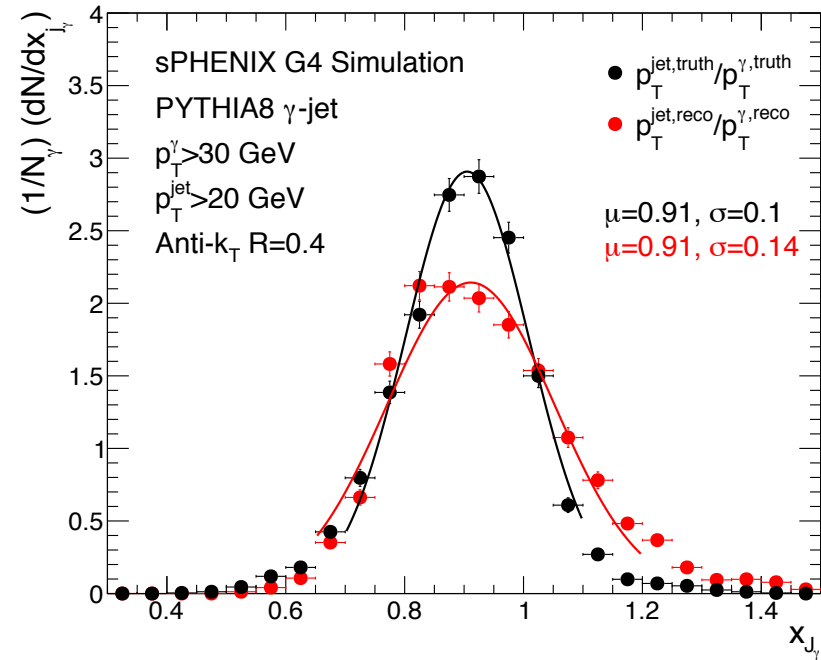
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$$X_{J\gamma} = \frac{p_T^\gamma}{p_T^{\text{jet}}}$$



Jet-to-Photon p_T balance

- γ -jet dominated by quark jets
 - Allows a flavor comparison between quarks and gluons
 - Allows direct comparison with LHC results
- Other observables under consideration
- sPHENIX capabilities for this observable were considered impressive at QM
 - These figures prompted much discussion over our ability to measure LHC-style observables



Au+Au plots - Complications

- During the separation of PHENIX and sPHENIX software divorce the UE subtraction didn't make it in
 - MIE studies were based on this UE subtraction
 - Needed for comparison!
 - Major long-term problem for the JS group that needs to be solved
 - Sarah Campbell has volunteered
 - Dennis and Rosi will help as needed
 - Additional UE subtraction methods will also be benchmarked
- Required to make real Au+Au jet performance plots

Conclusions

- A lot of work needs to be done to produce robust pp-to-AA comparisons
 - Background subtraction
 - ~hour per central Au+Au event for tracking reconstruction
- Proton-proton analysis framework is in good shape
- Photon clustering algorithms are in progress
- Higher level analysis tasks are starting
 - Colorado will work on the trigger for example
 - Largely presented in the Sims group
 - Overlap with other JS tasks in JS → Background subtraction for AA triggering for example
- Volunteers are always welcome!!
- Inviting experts to speak to the group
 - Marta Verweij (CMS) - Jet Substructure
 - Martin Rybar (ATLAS) – Trigger